

Attorney's Docket No.:06816-065002

Amendment to the Claims:

This listing of claims replaces all prior versions, and listings, of claims in the application:

1. (Currently Amended) A quantum well infrared photodetector (QWIP) comprising:  
a substrate formed of a semiconductor material; and  
a plurality of photodetectors disposed relative to one another to form an array on said substrate, each photodetector having first and second quantum well structures, one stacked over the other and each comprising a plurality of alternating barrier layers and well layers, each well layer of each quantum well structure coupled between two barrier layers to support an intersubband transition between a bound ground energy state and an excited energy state within a common energy band where said excited energy state is substantially resonant with an energy of the well top,  
wherein materials, thicknesses and dimensions of said well layers and barrier layers are selected such that said first and said second quantum well structures effect intersubband transitions at first and second wavelengths, respectively,  
wherein none of said two quantum well structures is short circuited, and wherein said barrier layers are sufficiently thick with a thickness of at least 500 angstroms to substantially eliminate carrier tunneling;

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a first set of optical cross gratings coupled to even rows of said detectors and optimized to diffract radiation at said first wavelength to be absorbed by said first quantum well structure; and

a second set of optical cross gratings coupled to odd rows of said detectors and optimized to diffract radiation at said second wavelength to be absorbed by said second quantum well structure.

2. (Cancelled)

3. (Previously presented) A QWIP as in claim 1 wherein said two quantum well structures in each photodetector are separated by an intermediate contact layer.

4. (Previously presented) A QWIP as in claim 3 wherein said barriers in both quantum well structures are formed of  $Al_xGa_{1-x}As$ .

5-8. (Cancelled)

9. (Withdrawn) The QWIP as in claim 1 further comprising a multiplexer coupled to each photodetector in said array and generating a stream of data caused by radiation at said first

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wavelength and a stream of data caused by radiation at said second wavelength, so as to separately form images of the first and second wavelengths.

10. (Canceled)

11. (Previously presented) A QWIP as in claim 1 further comprising a continuum transport band, carrying a photocurrent from said wells, wherein the continuum transport band has a smooth energy level profile between wells in said two quantum well structures.

12. (Previously presented) A QWIP as in claim 11 wherein said barriers in one of said two quantum well structures have a barrier height equal to that of the barriers in the other one of said two quantum well structures.

13. (Previously presented) A QWIP as in claim 12 wherein each barrier is formed of a material including aluminum, wherein the aluminum mole ratio is the same for the barriers in both quantum well structures.

14. Canceled.

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15. (Previously presented) A QWIP as in claim 1 wherein said barrier layers are made of  $Al_xGa_{1-x}As$ , and said second group of wells are formed of  $Al_yGa_{1-y}As$  where  $x$  is not equal to  $y$ .

16. (Previously presented) A QWIP as in claim 1 wherein said excited energy state is substantially resonant with an energy of the well top and has a deviation from said well top by less than about 2% of the well top.

17-35. (Canceled)

36. (Previously presented) A QWIP as in claim 1, further comprising:

a first contact layer formed over said substrate in each photodetector, wherein said first quantum well structure is formed on said first contact layer;

a second contact layer formed over said first quantum well structure in each photodetector;

a first electric contact connected to said second contact layer to output a signal caused by absorption of radiation at said first wavelength by said first quantum well structure;

a third contact layer formed over said second quantum well structure; and

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a second electric contact connected to said third contact layer to output a signal caused by absorption of radiation at said second wavelength by said second quantum well structure.

37. (Withdrawn) A QWIP as in claim 36, further comprising a multiplexer coupled to said first and said second electric contacts in each photodetector in said array and simultaneously generating a stream of data caused by radiation at said first wavelength and a stream of data caused by radiation at said second wavelength, so as to separately and simultaneously form images of said first and second wavelengths.

38. (Previously presented) A QWIP as in claim 1, wherein well layers of one quantum well structure include GaAs and well layers of another quantum well structure include InGaAs.

39. (Previously presented) A QWIP as in claim 1, wherein well layers of one quantum well structure include GaAs and well layers of another quantum well structure include AlGaAs.

40. (Previously Presented) A QWIP as in claim 1, wherein said barrier layers have a thickness from 500 angstroms to 600 angstroms.

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41. (Currently Amended) A method, comprising:

providing an array of photodetectors in columns and rows,

[[a]] each photodetector having first and second quantum well structures stacked over each other to absorb radiation of first and second wavelengths, respectively, wherein each quantum well structure comprises a plurality of alternating barrier layers and well layers to support an intersubband transition between a bound ground energy state and an excited energy state within a common energy band;

making said excited energy state to be substantially resonant with an energy of the well top to increase efficiency in producing a photocurrent by photo excitation without tunneling; and

making said barrier layers sufficiently thick with a thickness of at least 500 angstroms to substantially eliminate carrier tunneling that contributes to a dark current; and

using a first set of optical cross gratings coupled to even rows of said detectors to diffract radiation at said first wavelength to be absorbed by said first quantum well structure with an optimized efficiency; and

using a second set of optical cross gratings coupled to odd rows of said detectors to diffract radiation at said second wavelength to be absorbed by said second quantum well structure with an optimized efficiency.